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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,562	05/13/2004	Steven P. Barkyoub	BUR920040060US1	3561
30449	7590	02/17/2006	EXAMINER	
SCHMEISER, OLSEN + WATTS			NGUYEN, TUAN H	
3 LEAR JET LANE			ART UNIT	
SUITE 201			PAPER NUMBER	
LATHAM, NY 12110			2813	

DATE MAILED: 02/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/709,562

Applicant(s)

BARKYOUNB ET AL.

Examiner

Tuan H. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 11-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>5/13/04</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election with traverse of Group I, and Species I, claims 1-10 in the reply filed on 6/13/05, and 2/07/05 is acknowledged. The traversal is on the ground(s) that the subject matter of all claims 1-30 is sufficiently related that a thorough search for the subject matter of any group of claims would encompass a search for the subject matter of the remaining claims; and because Species I, II, III are not mutually exclusive. This is not found persuasive because the product and process as well as the species are independent and distinct inventions as noted in the Restriction Requirements.

The requirement is still deemed proper and is therefore made FINAL.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-7 are rejected under 35 U.S.C. 102(e) as being anticipated by Kobayashi et al. (US 6,562,219).

Kobayashi et al., figs. 1-2 and text on col. 2-8 teaches the claimed method for forming a seed layer 4 on a semiconductor substrate 2 including the steps of depositing a copper seed layer 4 on the semiconductor structure (col. 5, last two paragraphs); and

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raising the temperature (annealing) of the seed layer 4 above the water condensation temperature, 300-400°C (paragraph bridging col. 5-6), wherein the seed layer 4 has not been subjected to water vapor prior to raising the temperature of the seed layer 4.

See particularly col. 6, second paragraph which states: "the process up to the anneal chambers 13, which is to say the processes up to the formation of the first copper film 4 on the diffusion barrier film, are preferably carried out consecutively in a vacuum environment without exposing the substrate 19 to air (which inherently includes water vapor) during the treatment.". This process is performed in a multi-chamber apparatus as shown in fig. 1.

With respect to claim 2, col. 6, lines 16-22 discloses an alternative annealing process wherein the vacuum is discontinued after forming the copper film 4 and the substrate is exposed to the air and the anneal is then carried out in an electric furnace.

With respect to claim 3, see col. 7, next to last paragraph for a further step of depositing a second copper layer 5.

With respect to claimed 5, see col. 5, lines 31-52 for the step of depositing a diffusion barrier layer 3.

With respect to claims 6, 7, col. 6, first paragraph discloses the delivery of Ar gas into the anneal chamber for annealing the seed layer 4.

Claims 1, 3-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Pan et al. (US 2005/0054202).

Pan et al., figs. 1-3 discloses the claimed process for forming a seed layer 26 on a semiconductor structure including the steps removing moisture and oxygen by DEGAS/baking process in DEGAS chamber, the DEGAS chamber may be a conventional PVD chamber (paragraph [0020]-[0023]) before the steps of forming a diffusion barrier layer 22, and a copper seed layer 26 (paragraphs [0024]-[0025]) by PVD and /or CVD at temperature of about 250-450<sup>0</sup>C which is above the water condensation temperature.

With respect to claim 3, see paragraph [0028] for a further step of forming copper layer 28.

With respect to claims 6-10, Pan, paragraph [0020] teaches the use of sputtering tool which includes a chuck for carrying out the DEGAS and PVD process. The DEGAS/baking process uses an inert gas for raising the substrate temperature as disclosed in paragraph [0021].

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Soininen et al., Bhan et al., and Chung et al. disclose related method for forming copper interconnect.

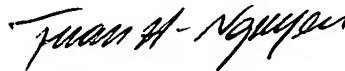
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tuan H. Nguyen whose telephone number is 571-272-1694. The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on 571-272-1702. The fax phone

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number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Tuan H. Nguyen  
Primary Examiner  
Art Unit 2813